

REMARKS

With the cancellation herein without prejudice of claims 1 to 3, 5 to 10, 12 to 15, 41 to 43, 45 to 50, and 52 to 55, claims 4, 11, 16 to 30, 44, 51, and 56 are pending and being considered in the present application since claims 31 to 40 were previously withdrawn from consideration. In view of the foregoing amendments and following remarks, it is respectfully submitted that all of the presently pending claims are allowable, and reconsideration of the present application is respectfully requested.

Claims 1 to 11 and 41 to 51 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,869,384 (the “Yu” reference) in view of United States Patent No. 6,436,790 (the “Ito” reference).

As an initial matter, claims 1 to 3, 5 to 10, 41 to 43, and 45 to 50 have been canceled herein without prejudice, thereby rendering moot the present rejection with respect to those claims.

As for the remaining claims, to reject a claim under 35 U.S.C. § 103(a), the Office bears the initial burden of presenting a *prima facie* case of obviousness. *In re Rijekaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish *prima facie* obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). As clearly indicated by the Supreme Court, it is “important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements” in the manner claimed. *See KSR Int’l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007). In this regard, the Supreme Court further noted that “rejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Id.*, at 1396. Second, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim features. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

Claim 4 has been rewritten herein in independent form and to include the subject matter of its base claim and any intervening claim. Claim 4 provides that the second temperature to which the substrate is heated to anneal the sub-layers is approximate to the

highest processing temperature subsequently applied to the substrate following formation of the silicon oxide layer. The Final Office Action conclusorily asserts that column 10, lines 4 to 12 and 49 to 55 of the “Yu” reference discloses this feature. Specifically, the Final Office Action relies on the reference in “Yu” to 920 degrees as disclosing the “highest processing temperature.” In fact, as explained in Applicants’ Response dated April 17, 2008, the cited section does not refer to the temperature of 920 degrees. Instead, a reference to 920 degrees is made once in the “Yu” reference at column 9, line 10. The reference there is to a temperature employed during the formation of the silicon oxide layer and it is not a discussion of a processing temperature that is reached subsequent to the formation of the silicon oxide layer (which formation is relied upon by the Final Office Action as assertedly disclosing the formation of the silicon oxide layer of claim 1). Indeed, nowhere does the “Yu” reference disclose or suggest forming a silicon oxide layer which includes heating a substrate to anneal a sub-layer of the silicon oxide layer, where the temperature to which the substrate is heated for the annealing is approximate to a highest processing temperature applied subsequent to the forming of the silicon oxide layer, as provided for in the context of claim 4.

The discussion at column 10, lines 56 to 66 of the “Yu” reference, referred to in the Advisory Action does not correct the above noted critical deficiencies of the “Yu” reference, since it does not indicate that the 920 degrees is a second temperature used for annealing, which temperature is higher than another temperature used for oxidizing, and also does not refer to any such temperature which is approximate to the highest processing temperature subsequently applied to a substrate following formation of a silicon oxide layer.

The secondary “Ito” reference does not cure this critical deficiency of the primary reference. While the Advisory Action asserts that column 3, line 64 to column 4, line 4, and column 4, lines 9 to 65 of the “Ito” reference disclose these features, any review of the cited section makes plain that it does not at all relate to these features of claim 4. The cited section makes no reference to oxidation. Additionally, while the cited section states that a heat treatment is performed at 800 degrees, the cited section does not state that this temperature is higher than that used for an oxidizing step and is approximate to a highest processing temperature applied subsequent to a forming of a silicon oxide layer.

Accordingly, the combination of the “Yu” and “Ito” references does not disclose or suggest all of the features recited in claim 1 as currently presented, so that the combination of the “Yu” and “Ito” references does not render unpatentable claim 4.

Claim 11 relates to a method of forming a silicon oxide layer and provides for forming a silicon oxide layer with a compressive stress and heating a substrate to anneal the silicon oxide layer. Nothing in the “Yu” reference discloses or suggests forming a silicon oxide layer with a compressive stress, as provided in the context of the claimed subject matter. The secondary “Ito” reference does not cure, and is not asserted to cure, this critical deficiency of the primary reference. The Advisory Action notes that one who performs the steps of a process must necessarily produce all of its advantages. However, the cited references do not disclose performing the required steps for forming a silicon oxide layer with a compressive stress. It is noted that not every formation of a silicon oxide layer results in its formation with a compressive stress.

Thus, the combination of the “Yu” and “Ito” references does not disclose or suggest all of the features recited in claim 11, so that the combination of the “Yu” and “Ito” references does not render unpatentable claim 11.

Claim 44 has been rewritten herein in independent form and to include the features of its base claim and any intervening claim. Claim 44 provides that the second temperature to which the substrate is heated to anneal the sub-layers is approximate to the highest processing temperature subsequently applied to the substrate following formation of the silicon oxide layer. As explained above as to claim 1, the combination of the “Yu” and “Ito” references does not disclose or suggest this feature.

Therefore, the combination of the “Yu” and “Ito” references does not disclose or suggest all the features of claim 44, so that the combination of the “Yu” and “Ito” references does not render unpatentable claim 44.

Claim 51 has been rewritten in independent form and to include the features of its base claim. Claim 51 provides for forming a silicon oxide layer with a compressive stress. As explained above as to claim 11, even if the relied upon section of the “Yu” reference may suggest that little additional tensile stress is introduced, it does not identically disclose forming a layer with a compressive stress. Indeed, any review of the “Yu” reference makes plain that it does not identically disclose or suggest this feature. The secondary “Ito” reference does not cure, and is not asserted to cure, this critical deficiency of the primary reference.

Thus, the combination of the “Yu” and “Ito” references does not disclose or suggest all the features of claim 51, so that the combination of the “Yu” and “Ito” references does not render unpatentable claim 51.

Withdrawal of this obviousness rejection is therefore respectfully requested.

Claims 12 to 15 and 52 to 55 were rejected under 35 U.S.C. § 103(a) as unpatentable over the “Yu” reference in view of the “Ito” reference and further in view of United States Patent No. 6,602,806 (the “Xia” reference).

Claims 12 to 15 and 52 to 55 have been canceled herein without prejudice, thereby rendering moot the present rejection.

Claims 16 to 18, 22 to 24, 26, 29, and 30 were rejected under 35 U.S.C. § 103(a) as unpatentable over the “Yu” reference in view of United States Patent No. 6,544,898 (the “Polson” reference).

Claim 16 relates to a method of forming a MEMS and provides for forming a MEMS structure on a substrate, oxidizing a silicon precursor gas to form a silicon oxide layer, and heating the substrate to anneal the silicon oxide layer. With respect to the steps of forming and annealing the silicon oxide layer, the Final Office Action refers to the “Yu” reference as assertedly disclosing these features. The Final Office Action admits that the “Yu” reference is unrelated to a MEMS, but instead refers to the “Polson” reference as assertedly disclosing forming a MEMS structure on a substrate. The Final Office Action further asserts that it would have been obvious to modify the method of the “Yu” reference to include forming a MEMS structure on the substrate as assertedly taught by the “Polson” reference prior to the steps of forming and annealing the silicon oxide.

However, one skilled in the art would not have formed and annealed silicon oxide as in the “Yu” reference to a substrate that includes a MEMS structure since such oxide layers tend to damage MEMS structures, as explained in the Specification, e.g., at page 3, lines 14 to 20. Accordingly, the modification suggested by the Final Office Action would have been unpredictable in view of the prior art and necessarily relies on improper hindsight reasoning based on the present disclosure.

In the “Response to Arguments” section, the Final Office Action asserts that *“claim 16 does not require formation of a silicon oxide layer on a MEMS structure or even on the substrate. Therefore applicant’s arguments are apparently without merit.”* Applicants do not directly address this argument presented in the “Response to Arguments” section because whether or not claim 16 requires formation of a silicon oxide layer is not at issue. Rather, the issue is whether one skilled in the art would have combined the “Yu” and “Polson” references as suggested in the Final Office Action in order to make a *prima facie* case of obviousness against that which is recited in the claim.

In an attempt to make its case of obviousness, the Final Office Action suggests a combination of the “Yu” and “Polson” references. In support of the argument that one skilled in the art would have made the suggested combination, the Final Office Action states that one would have been motivated to modify the method of the “Yu” reference to include forming a MEMS structure on the substrate as in the “Polson” reference. Applicants’ counter-argument negates this argument of the Final Office Action. That is, Applicants’ argument shows that the Final Office Action has not provided any sustainable reasoning as to why one skilled in the art would have combined the references as suggested by the Final Office Action.

Stated otherwise, Applicants’ have effectively removed the suggested combination of the “Yu” and “Polson” references, so that the suggested combination of the “Yu” and “Polson” references cannot be used to reject claim 16. Since one skilled in the art would not have made the suggested combination of the teachings of the references relied upon by the Examiner to reject claim 16, therefore, the Examiner has yet to provide any reference or combination of references which discloses or suggests the features of claim 16. Therefore, the Final Office Action fails to make a *prima facie* case of obviousness with respect to claim 16.

As further regards claim 16, in the “Response to Arguments” section, the Final Office Action asserts that “[i]t was well known in the art at the time of the invention to form silicon oxide deposition layers overtop micromechanical chambers followed by annealing.” In support of this contention, the Final Office Action refers to paragraph [0046] of U.S. Patent Application No. 2004/0065932 (the “Reichenbach” reference). It is respectfully submitted that the cited reference does not support the assertions of the Final Office Action. In fact, the cited section of “Reichenbach” makes no reference to the annealing of the oxide layer, but rather of **polysilicon**. In this regard, it is provided that “a deposition layer **32**, in particular of **polysilicon**, is deposited as a deposition layer over the entire surface (FIG.8). (The “Reichenbach” reference, paragraph [0046], (emphasis added).) The deposition layer 32 (polysilicon) is distinct from the oxide layer (30). The cited section relied upon by the Final Office Action further provides that the “tempering of the **deposition layer 32** can advantageously be done with the aid of the RTP (Rapid Thermal Processing) or RTA (Rapid Thermal Annealing) reactor. (*Id.*, emphasis added.) Thus, the only annealing discussed by the “Reichenbach” reference relates to deposition layer 32 (**polysilicon**) and not the oxide layer (30).

Accordingly, the combination of the “Yu” and “Polson” references does not disclose or suggest all of the features recited in claim 16, so that the combination of the “Yu” and “Polson” references does not render unpatentable claim 16 or any of its dependent claims, e.g., claims 17, 18, 22 to 24, 26, 29, and 30.

As further regards claim 22, it provides that the second temperature to which the substrate is heated to anneal the silicon oxide layer is approximately the highest processing temperature applied to the substrate following the annealing of the silicon oxide layer. The Final Office Action refers to column 10, lines 4 to 12 and 49 to 55 of the “Yu” reference as assertedly disclosing this feature. As more fully explained above as to patentability of claim 4, the cited section of the “Yu” reference does not disclose or suggest this feature, and nowhere does the “Yu” reference disclose or suggest this feature.

For this additional reason, the combination of the “Yu” and “Polson” references does not disclose or suggest all of the features of claim 22, so that claim 22 is allowable for this additional reason.

As further regards claim 30, it provides for forming a silicon oxide layer with a compressive stress. The Final Office Action refers to the “Yu” reference as assertedly disclosing this feature. However, as more fully explained above as to claim 11, even if the relied upon section of the “Yu” reference may suggest that little additional tensile stress is introduced, it does not disclose forming a layer with a compressive stress. Indeed, any review of the “Yu” reference makes plain that it does not disclose or suggest these features.

For this additional reason, the combination of the “Yu” and “Polson” references does not disclose or suggest all of the features recited in claim 30, so that claim 30 is allowable for this additional reason.

Withdrawal of this obviousness rejection of claims 16 to 18, 22 to 24, 26, 29, and 30 is therefore respectfully requested.

Claims 19 and 25 were rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of the “Yu” reference, the “Polson” reference, and United States Patent No. 5,256,247 (the “Watanabe” reference).

Claims 19 and 25 ultimately depend from claim 16 and are therefore allowable over the cited references since the “Watanabe” reference does not correct the critical deficiencies of the combination of the “Yu” and “Polson” references explained as to claim 16.

Withdrawal of this obviousness rejection of claims 19 and 25 is therefore respectfully requested.

Claims 20 and 21 were rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of the “Yu” reference, the “Polson” reference, the “Watanabe” reference, and United States Patent No. 5,990,019 (the “Torek” reference).

Claims 20 and 21 ultimately depend from claim 19 and are therefore allowable over the cited references since the “Torek” reference does not correct the critical deficiencies of the combination of the “Yu,” “Polson,” and “Watanabe” references explained above as to claim 19.

Withdrawal of this obviousness rejection of claims 20 and 21 is therefore respectfully requested.

Claims 27, 28, and 56 were rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of the “Yu” reference, the “Polson” reference, the “Watanabe” reference, the “Torek” reference, and United States Patent No. 5,904,570 (the “Chen” reference).

Claims 27, 28, and 56 ultimately depend from claim 16 and are therefore allowable over the cited references since the “Chen” reference does not correct the critical deficiencies of the combination of the “Yu,” “Polson,” “Watanabe,” and “Torek” references explained above as to claim 16.

As further regards claim 27 (and its dependent claim 28), it further provides that etching the silicon oxide layer includes applying a first etching process to the silicon oxide layer which forms an etch residue, oxidizing the etch residue, and applying a second etching process to the oxidized etch residue. The Final Office Action relies on a two stage etching process of “Watanabe” (of which the second stage produces an etch residue (see the “Watanabe” reference, column 4, lines 4 to 16)), as assertedly disclosing the first and second etching processes of claim 27, but admits that the “Watanabe” reference does not disclose oxidizing an etch residue formed by the first etching process. The Final Office Action instead conclusorily asserts the “Chen” reference as assertedly disclosing this feature.

Contrary to the assertion by the Final Office Action, the cited section (column 2, lines 43 to 49 of the “Chen” reference) states that an oxygen plasma is used for removing a photoresist mask which was previously applied for masking an etching pattern. After the removal of the photoresist mask, residue accumulated during the etching is removed. For the

removal, the integrated circuit is dipped into a solvent. Nowhere does the “Chen” reference disclose or suggest oxidizing the etch residue.

In the “Response to Arguments” section, it is asserted that column 1, lines 48 to 53 of the “Chen” reference discloses oxidizing the etch residue. However, the cited section does not support this assertion. The “Chen” reference merely states that “the polymeric residues which remain after the plasma-enhanced subtractive etching of polysilicon layers in reactive halogen-containing gases are removed by a combination of ashing in oxygen gas and removal with an organic solvent.” (The “Chen” reference, column 1, lines 48 to 53.) It is respectfully submitted that “**ashing in oxygen gas**” does not disclose nor suggest “**oxidizing** the etch residue” as provided in the context of the claimed subject matter.

Furthermore, even if the “Chen” reference does disclose performing the residue removal by oxidizing the residue (which it does not), the suggested modification of the etching of the “Watanabe” reference to include the asserted features of residue removal of the “Chen” reference would still not disclose the features of claim 27. At most, the “Chen” reference indicates that after etching is completed (and after the etching mask is removed), any remaining residue is removed. Thus, if the features of the “Chen” reference are applied to the method of the “Watanabe” reference, the resulting method would provide for performing the two stage etching process of the “Watanabe” reference, subsequently removing an etching mask, and subsequently removing the etch residue which is produced by the second stage of the “Watanabe” reference.

For these additional reasons, the combination of the “Yu,” “Polson,” “Watanabe,” “Torek,” and “Chen” references does not disclose or suggest all of the features recited in claim 27 from which claim 28 depends, so that claims 27 and 28 are allowable for these additional reasons.

Withdrawal of this obviousness rejection of claims 27, 28, and 56 is therefore respectfully requested.

Conclusion

In view of the foregoing, it is respectfully submitted that claims 4, 11, 16 to 30, 44, 51, and 56 are allowable. It is therefore respectfully requested that the objections and rejections be withdrawn. Prompt reconsideration and allowance of the present application are therefore respectfully requested.

Respectfully submitted,

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